2. The computer-implemented method of claim 1, wherein the image conversion algorithm is trained using generative adversarial networks.

3. The computer-implemented method of claim 2, wherein the image conversion algorithm is trained using an adversarial loss and a cycle consistency loss.

4. The computer-implemented method of claim 1, wherein virtually staining the DHM images includes colorization of white blood cells based on the type of each white blood cell.

5. The computer-implemented method of claim 4, further comprising quantifying a ratio of types of white blood cells within a sample based on the colorization of the white blood cells.

6. The computer-implemented method of claim 1, wherein the one or more cells include bacteria cells and colorization of the bacteria cells depends on the type of bacteria.

7. The computer-implemented method of claim 1, further comprising displaying the virtually stained DHM image through a graphical user interface.

8. A computer-implemented method for producing a virtually stained digital holographic microscopy (DHM) image, comprising:

receiving a first training data set comprising DHM images of individual white blood cells and a second training data set comprising images of actually stained white blood cells, wherein the images in the first training data set are not paired with the images in the second training data set;

applying a learning process which uses generative adversarial networks to the first training data set and the second training data set to generate an image conversion algorithm;

applying the image conversion algorithm to a DHM image to produce the virtually stained DHM image; and

displaying the virtually stained DHM image through a graphical user interface.

9. The computer-implemented method of claim 8, wherein the generative adversarial networks comprise a first generative network configured to generate a plurality of virtually stained DHM images and a first discriminating network configured to distinguish between the plurality of virtually stained DHM images and images in the second training data set.

10. The computer-implemented method of claim 9, wherein the generative adversarial networks further comprise a second generative network configured to generate a plurality of virtual DHM images and a second discriminat-

ing network configured to distinguish between the plurality of virtual DHM images and images in the first training data set.

11. The computer-implemented method of claim 8, wherein the learning process uses an adversarial loss and a cycle consistency loss to generate the image conversion algorithm.

12. The computer-implemented method of claim 8, wherein the graphical user interface is a mobile application executed on a mobile device.

13. A cell visualization system configured to produce virtually stained digital holographic microscopy (DHM) images, comprising:

a device configured to receive a DHM image of one or more cells and apply an image conversion algorithm to the DHM image to produce a virtually stained DHM image,

wherein the image conversion algorithm is generated using unpaired data sets.

14. The cell visualization system of claim 13, further comprising:

a device configured to generate the image conversion algorithm using the unpaired data sets, the unpaired data sets including a first training data set comprising DHM images of individual cells and a second training data set comprising images of actually stained cells.

15. The cell visualization system of claim 14, wherein the training device is configured with generative adversarial networks to generate the image conversion algorithm.

16. The cell visualization system of claim 15, wherein the generative adversarial networks comprise:

a first generative network configured to generate examples of virtually stained DHM images and a first discriminating network configured to distinguish between the examples of virtually stained DHM images and images in the second training data set; and

a second generative network configured to generate examples of virtual DHM images and a second discriminating network configured to distinguish between the examples of virtual DHM images and images in the first training data set.

17. The cell visualization system of claim 14, further comprising a DHM device configured to provide the first training data set to the training device.

18. The cell visualization system of claim 17, wherein the DHM device is further configured to provide the DHM image of one or more cells to the virtual staining device.

19. The cell visualization system of claim 13, wherein the one or more cells are white blood cells.

20. The cell visualization system of claim 13, wherein the virtually stained DHM image includes digital colorization of the one or more cells to imitate the appearance of a corresponding actually stained cell.

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